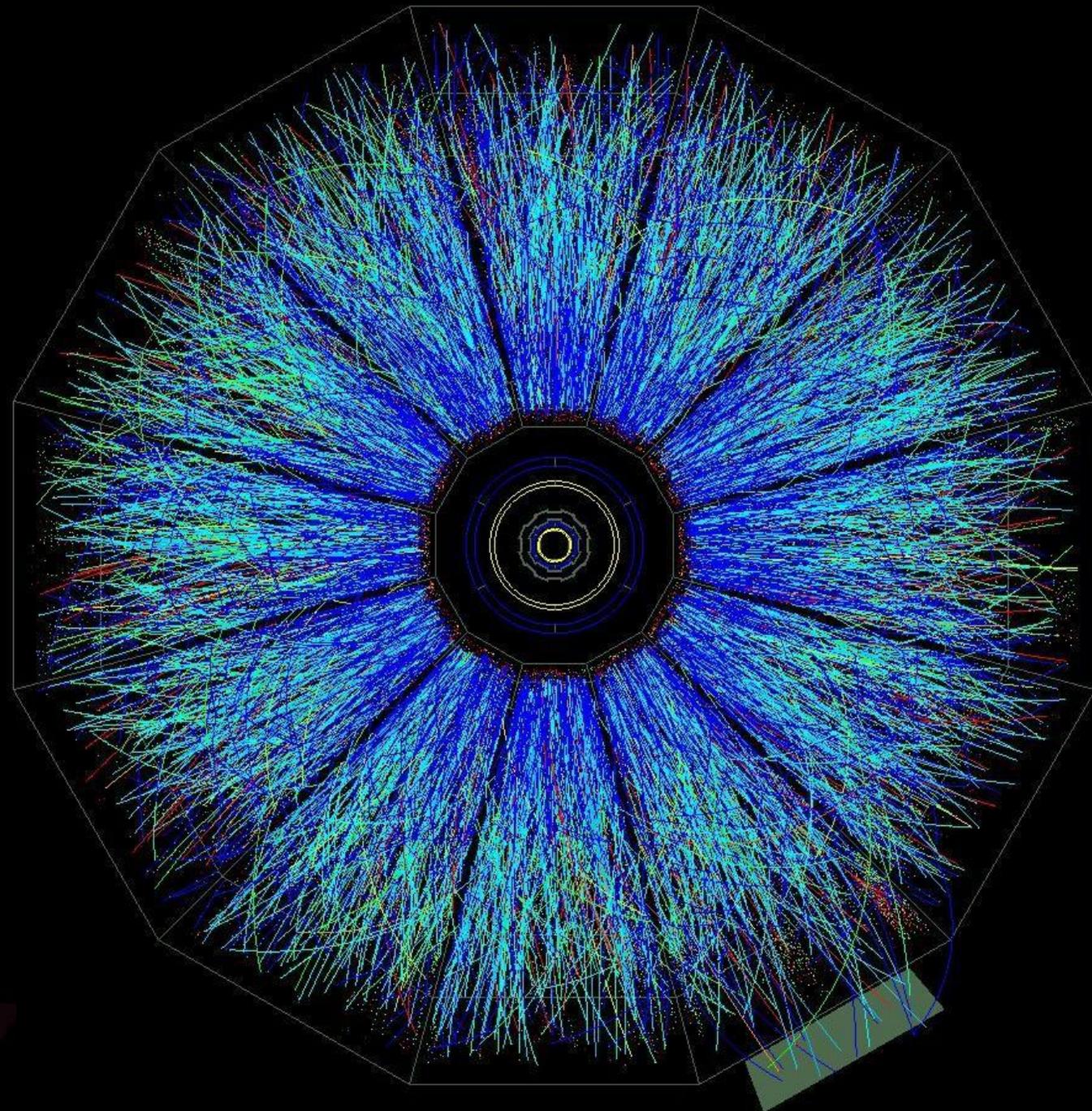


Ups and Downs with a bit of Strange

Evan Sangaline

UC Davis Thesis Flash Talk

June 11, 2015



INVESTIGATIVE REPORT

PLAYING GOD

**WILL BIG-BANG SCIENCE
END THE WORLD?**

The Price of Big Science, or The End of the World as We Know It!

The Profound Mysteries of Brookhaven National Laboratories

By Christopher Ketcham

Illustration by Chad Michael Ward



"We cannot know, as a matter of principle, the present in all its details."

Werner Heisenberg, author of the Heisenberg Uncertainty Principle

I am sitting in the Pine Barrens of New York's Long Island picking ticks off my legs under a starry sky, wondering whether the universe is open or closed—because that's the enduring question, whose answer can explain just a little why humans and parasites and starlight exist at all.

Some 15 billion years ago, all energy and matter that ever was or ever will be—the known universe—exploded into being in the Big Bang. That's the prevailing theory. Heretics in the scientific community say it's no less a myth than the Seven Days in the Book of Genesis.

There are two conjectures as to the gravitational forces that act on the energy created in the Big Bang. One is that gravity is insufficient to stop the Big Bang from a seemingly infinite "zoom" run. The other is that gravity is more powerful than energy and eventually will suck the Big Bang back to its starting point, effectively keeping the universe "closed."

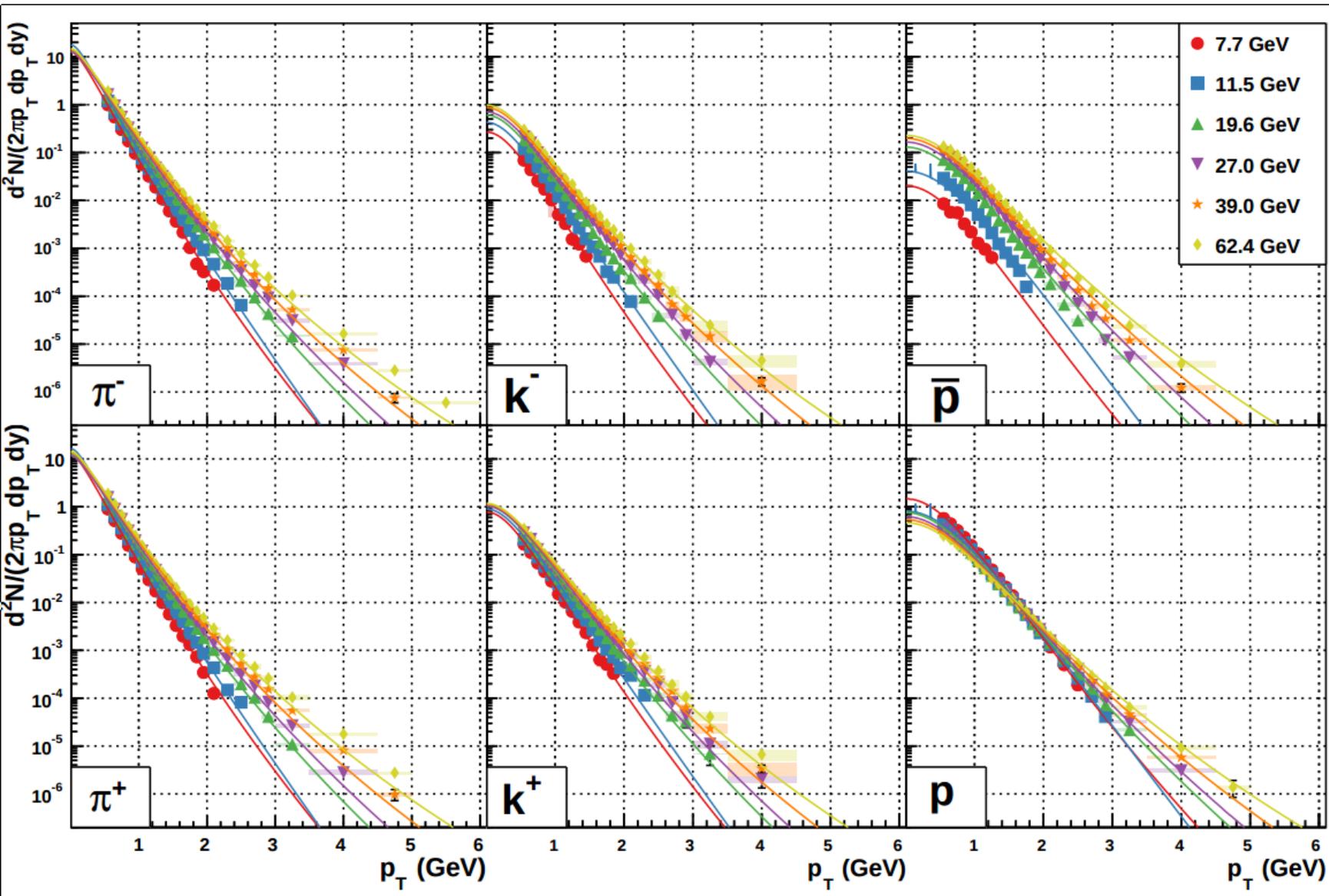
Which theory you choose to accept as "truth" makes all the difference in a discussion of the origins of our existence. In an open universe, there was nothing before the Big Bang. Then space, time and matter—which after many years spawns things like presidential politics, venereal disease and snuff films—appear out of the void. The idea is an insult to logic: How can something come from nothing? And why would somethingness—all this exotic, motile matter—be preferable in the laws of nature to simple static nothingness?

Unanswerable. And probably not worth the effort, because of a bigger quibbly: In an open universe, energy expands at quite a rapid pace for 20 or 30 billion years [pick a number], and then, with no gravity to pull it home, slowly, inevitably, the energy thins, sputters out and the universe dies. And there was no reason for it ever to have occurred in the first place. Unless, of course, you count God [more on him later].

Thanks to...

- ❖ Davis: Dan, Manuel, Chris, Tony
- ❖ LBL: Art, Grazyna, Alex, Patrick
- ❖ Misc: Jerome, Gary, Frank, Daniel, Paul, Mike
- ❖ and many more!

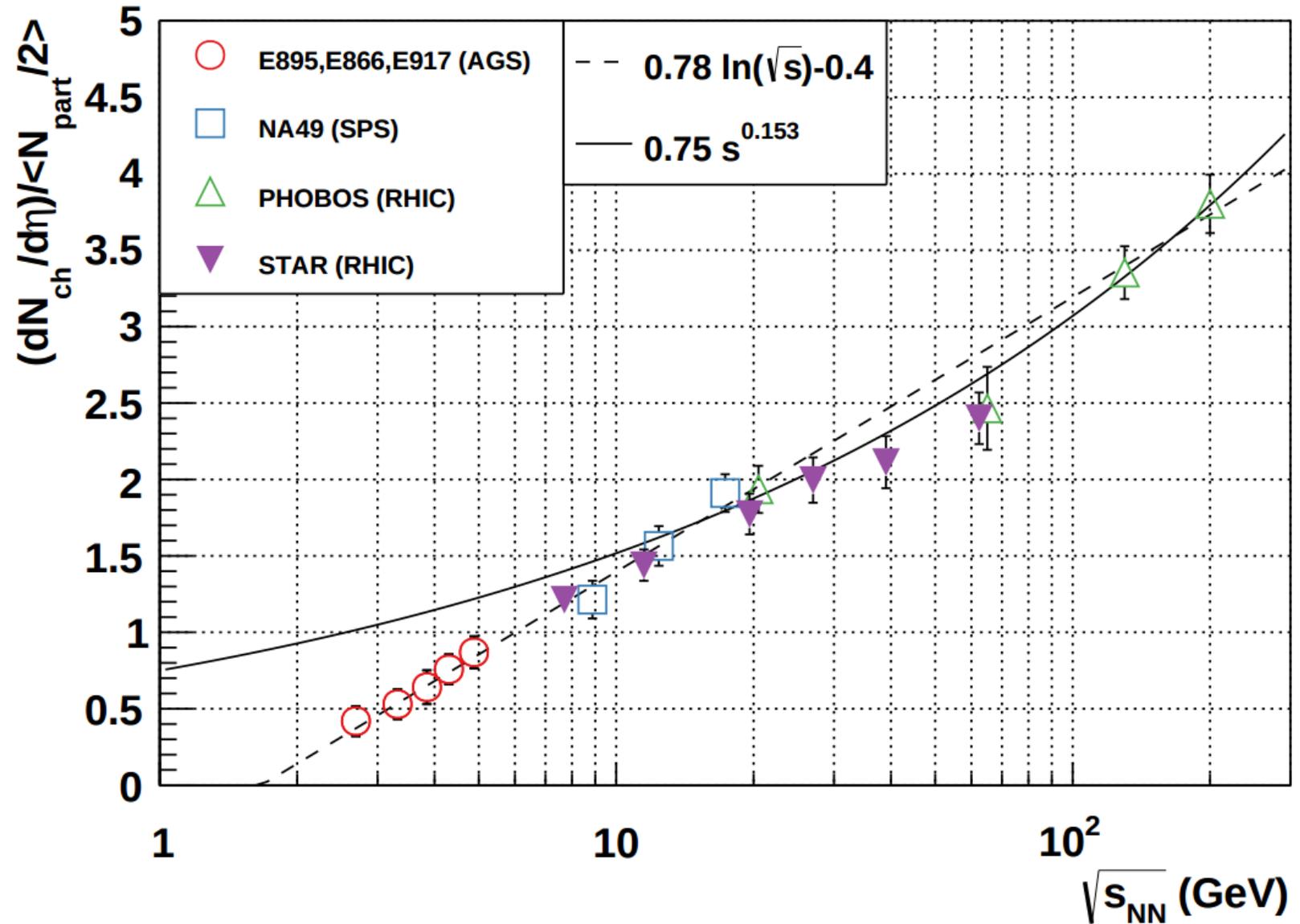
BES Spectra



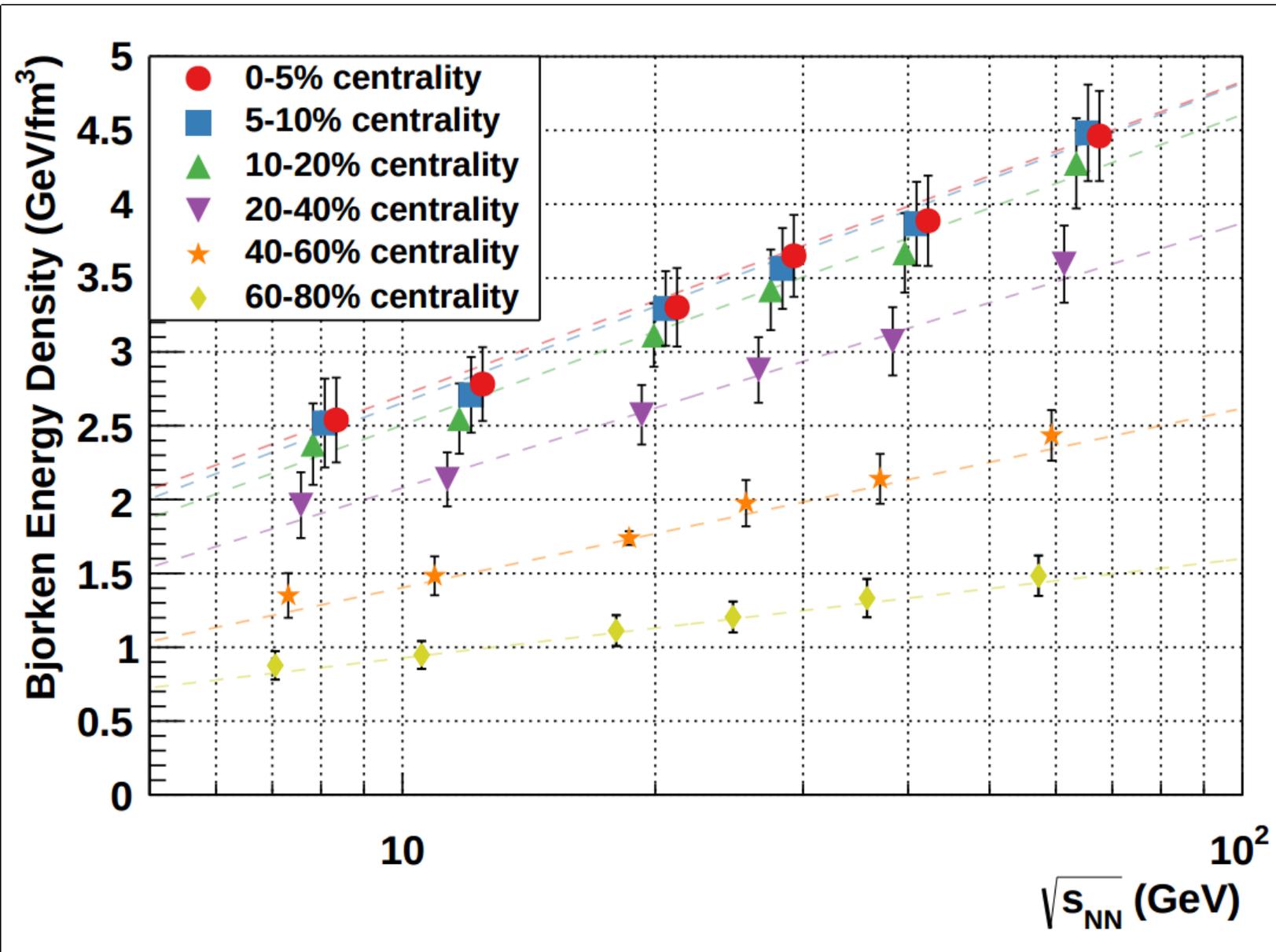
New distribution recentering approach allowed for the simultaneous fitting of dE/dx and ToF at high p_T .

Extracted Yields

Extracted yields show hints of inflection below 200 GeV.



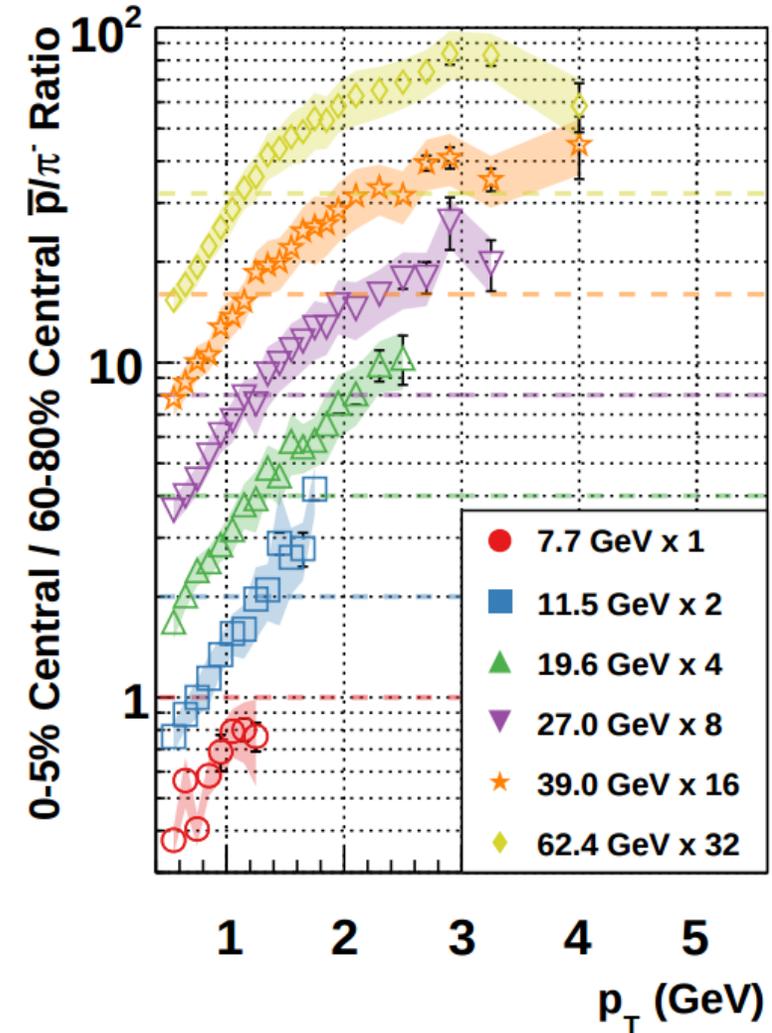
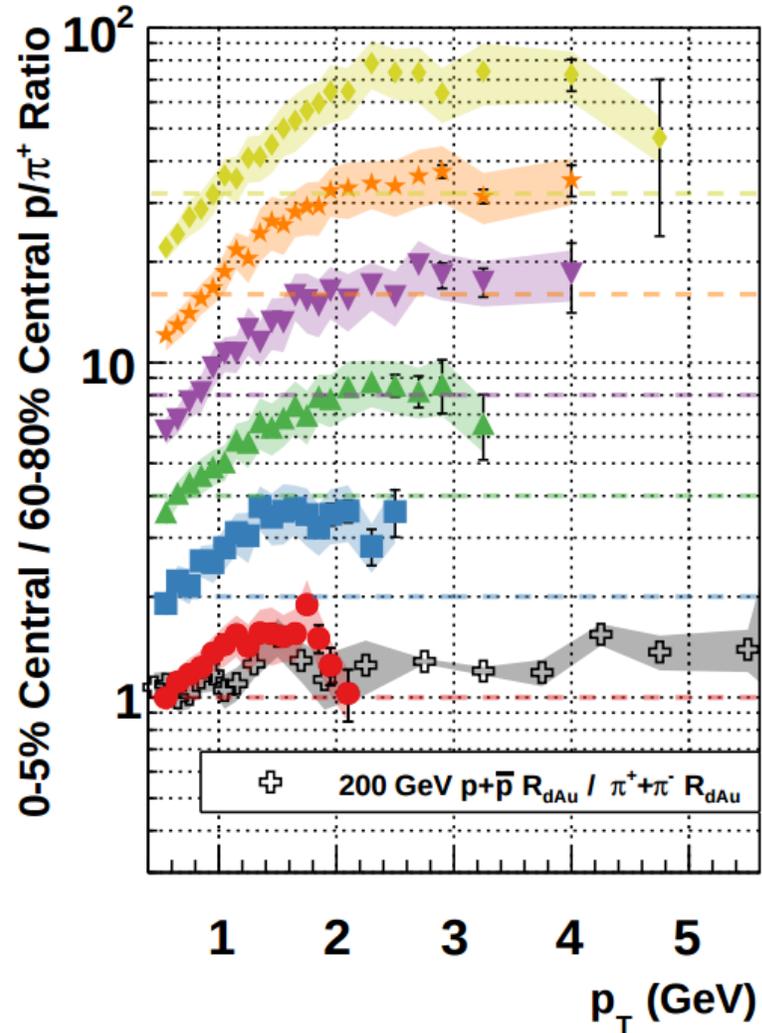
Bjorken Energy Density



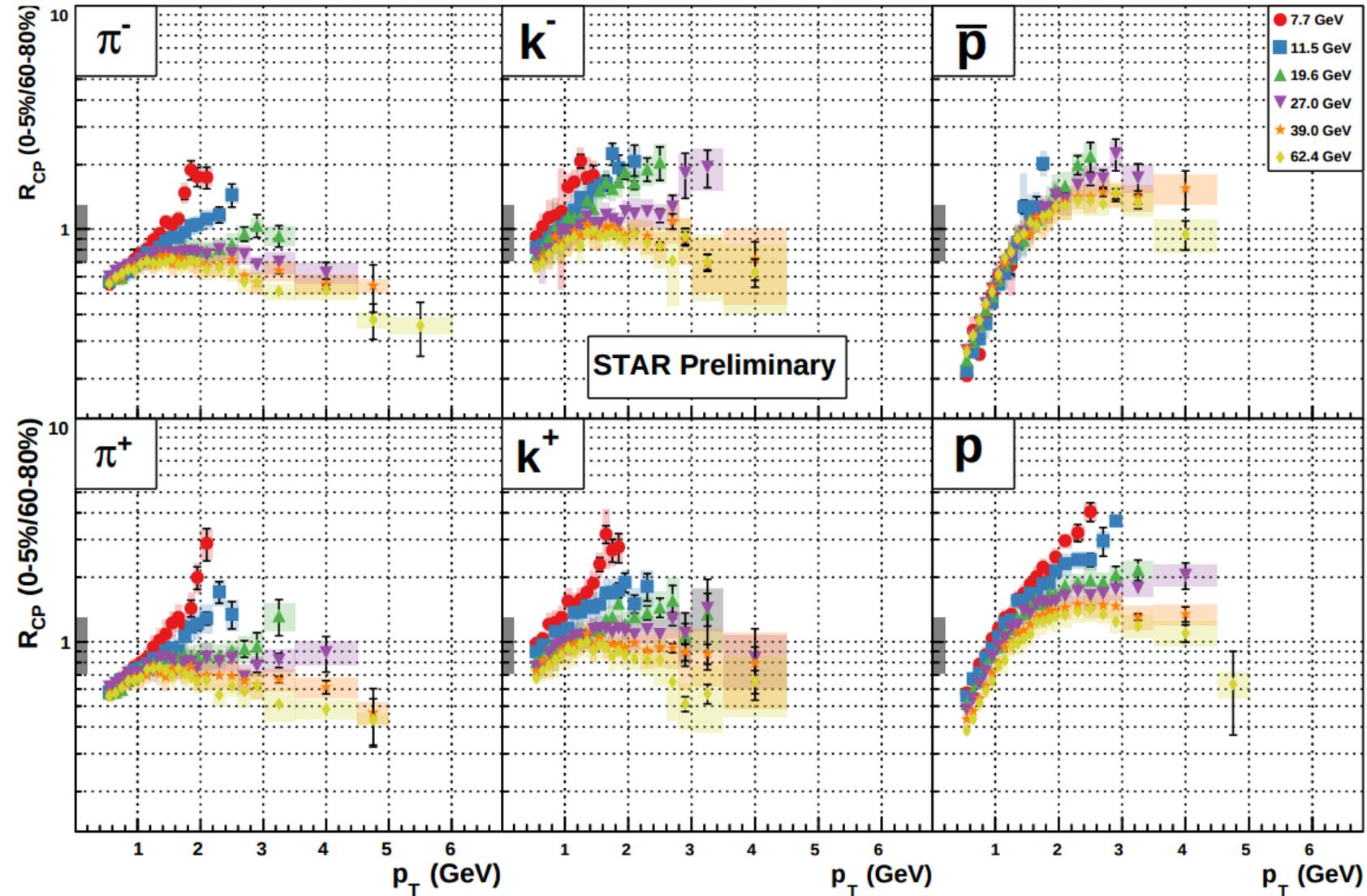
Energy densities in significant excess of nucleon density at all collision energies.

Baryon Enhancement

No discernable energy dependence of baryon enhancement.



Identified Particle R_{CP}



High p_T suppression
observed down to
27 GeV.

Thanks for your time!